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Vreeswijk et al.

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(54) **CHASSIS STRUCTURE FOR MID-WHEEL DRIVE POWER WHEELCHAIR**

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B62M 1/14 (2006.01)

(52) **U.S. Cl.** **280/250.1**; 280/304.1; 280/755; 180/22; 180/907

(58) **Field of Classification Search** 280/250.1, 280/304.1, 755; 180/22, 65.1, 907
See application file for complete search history.

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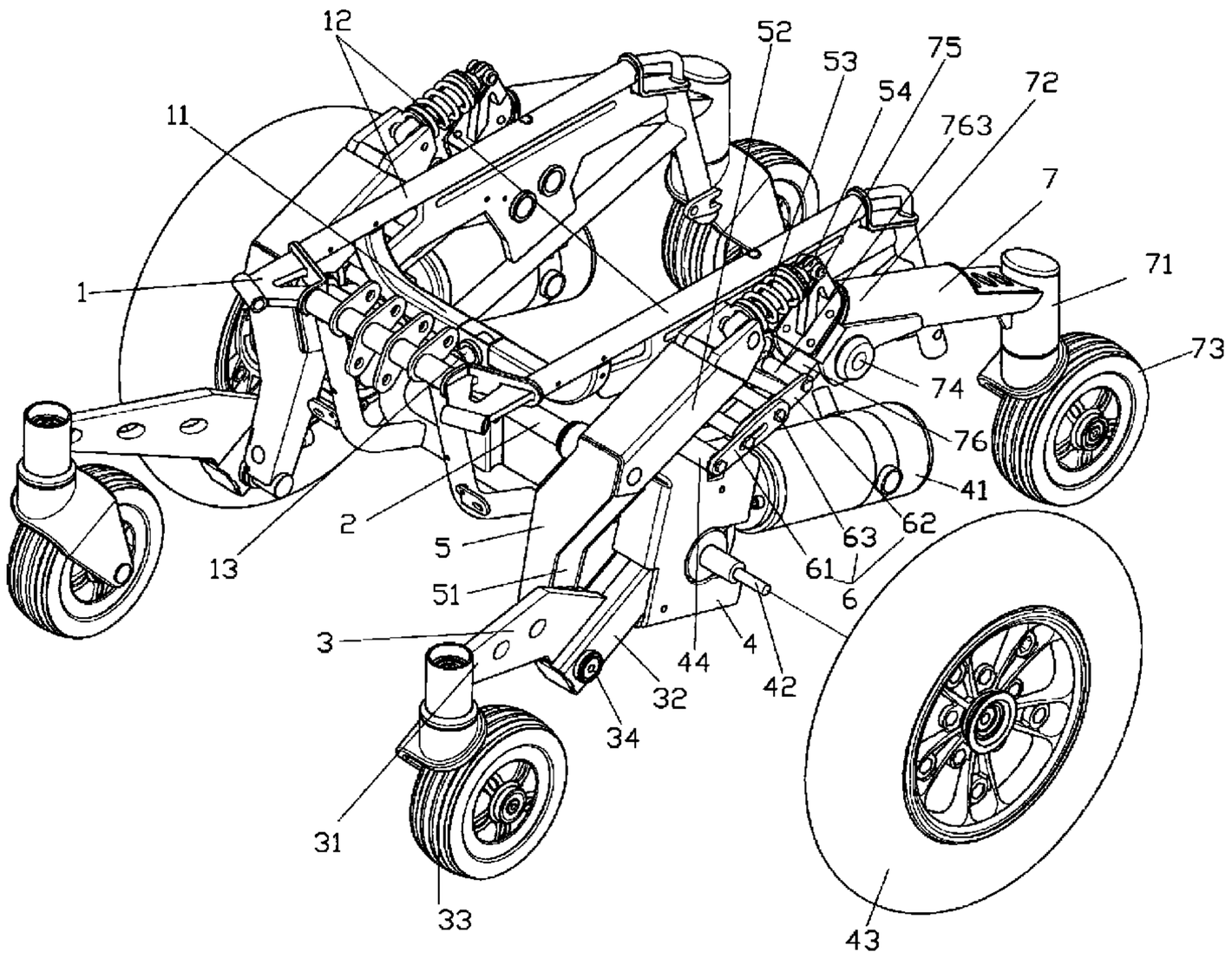
(57) **ABSTRACT**

A chassis structure for a mid-wheel drive power wheelchair includes a pair of restricting racks each having a first restricting plate and a second restricting plate. Each restricting plate has a slot at a central portion thereof. A first fixing member is inserted through one end of the first restricting plate and the slot of the second restricting plate, and a second fixing member is inserted through one end of the second restricting plate and the slot of the first restricting plate, so that the two restricting plates overlap to extend and restrict with each other for maintaining a steady and balancing ride.

2 Claims, 11 Drawing Sheets



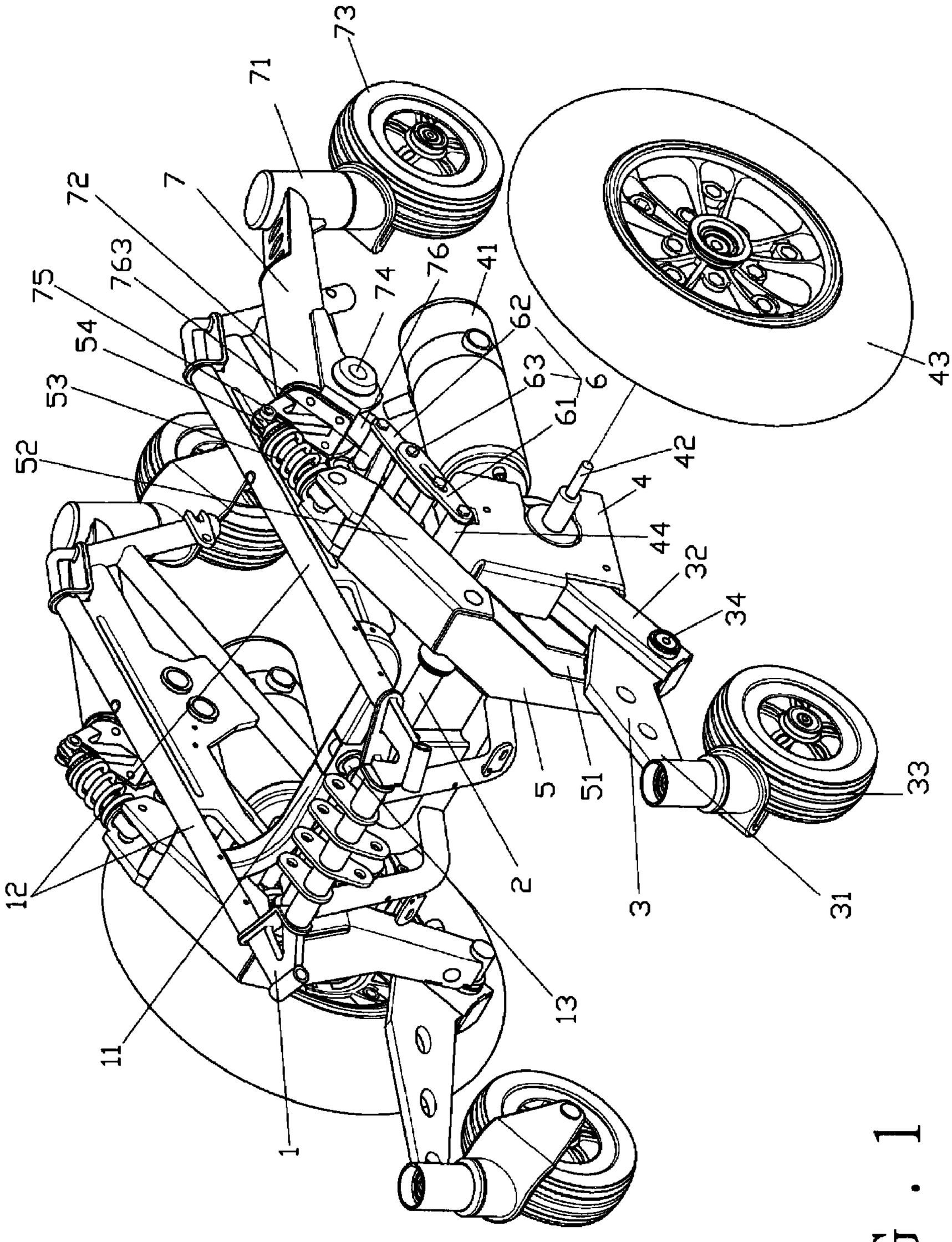

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FIG. 1

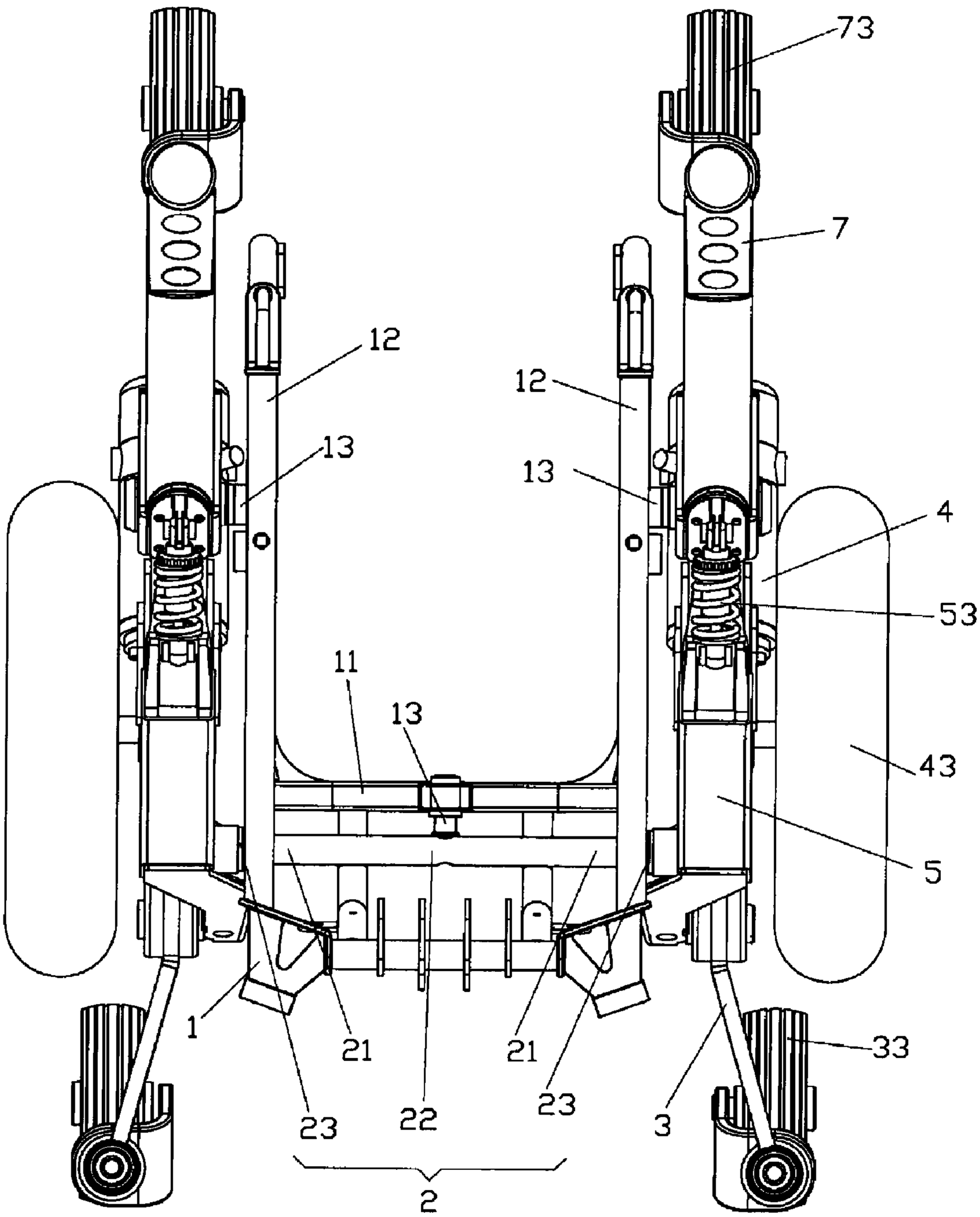

FIG. 2

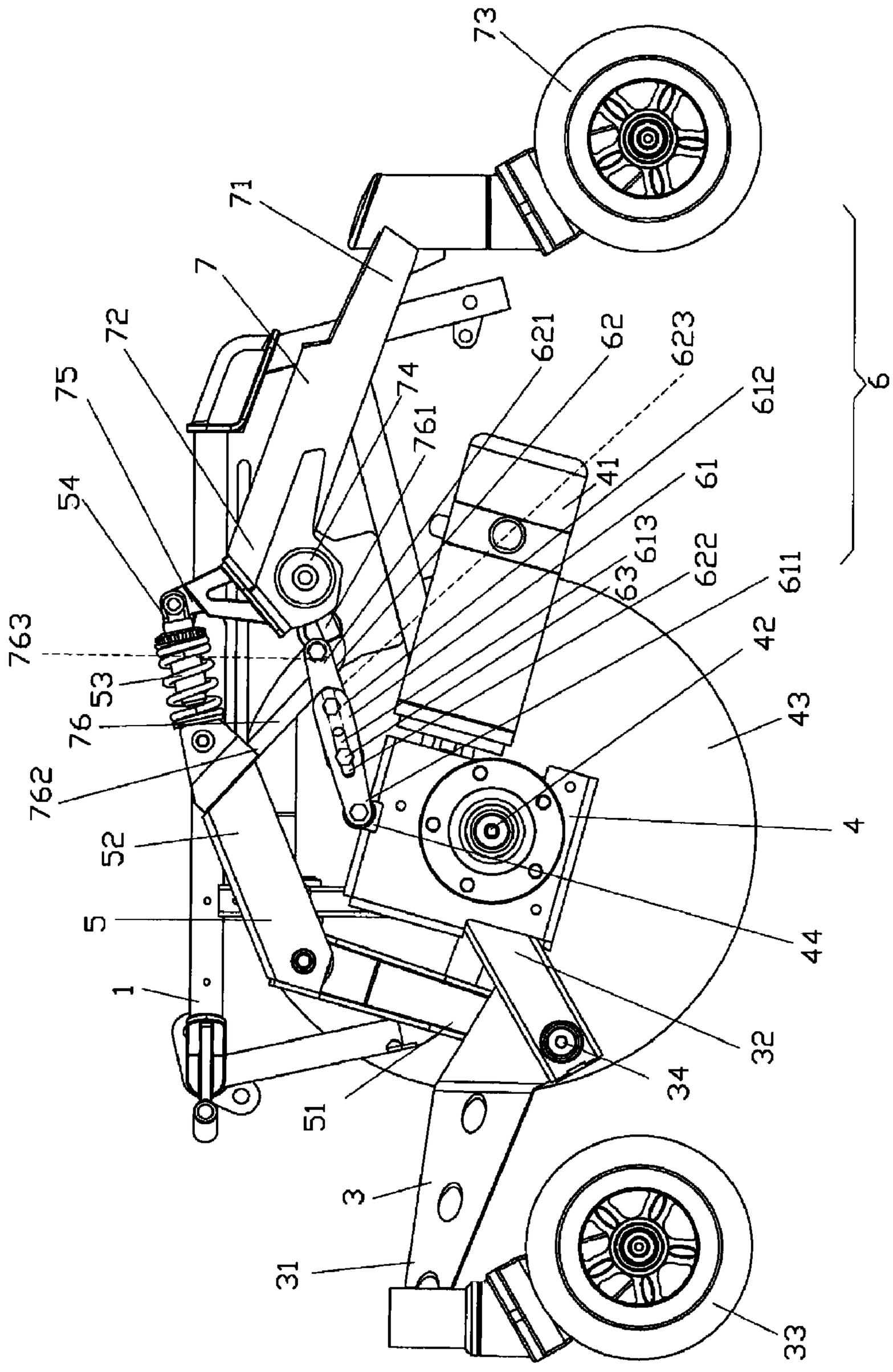
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FIG. 3

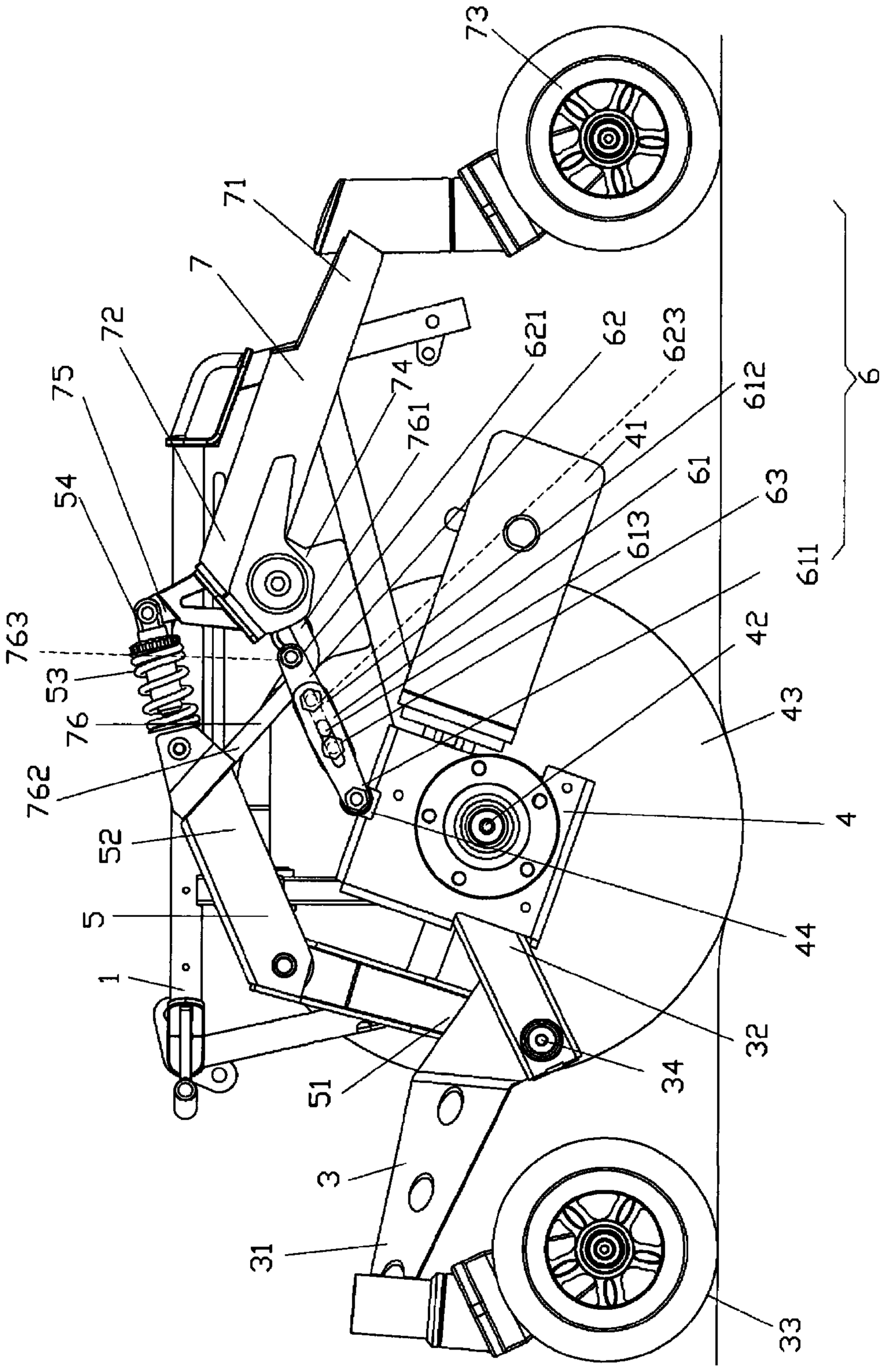
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FIG. 4

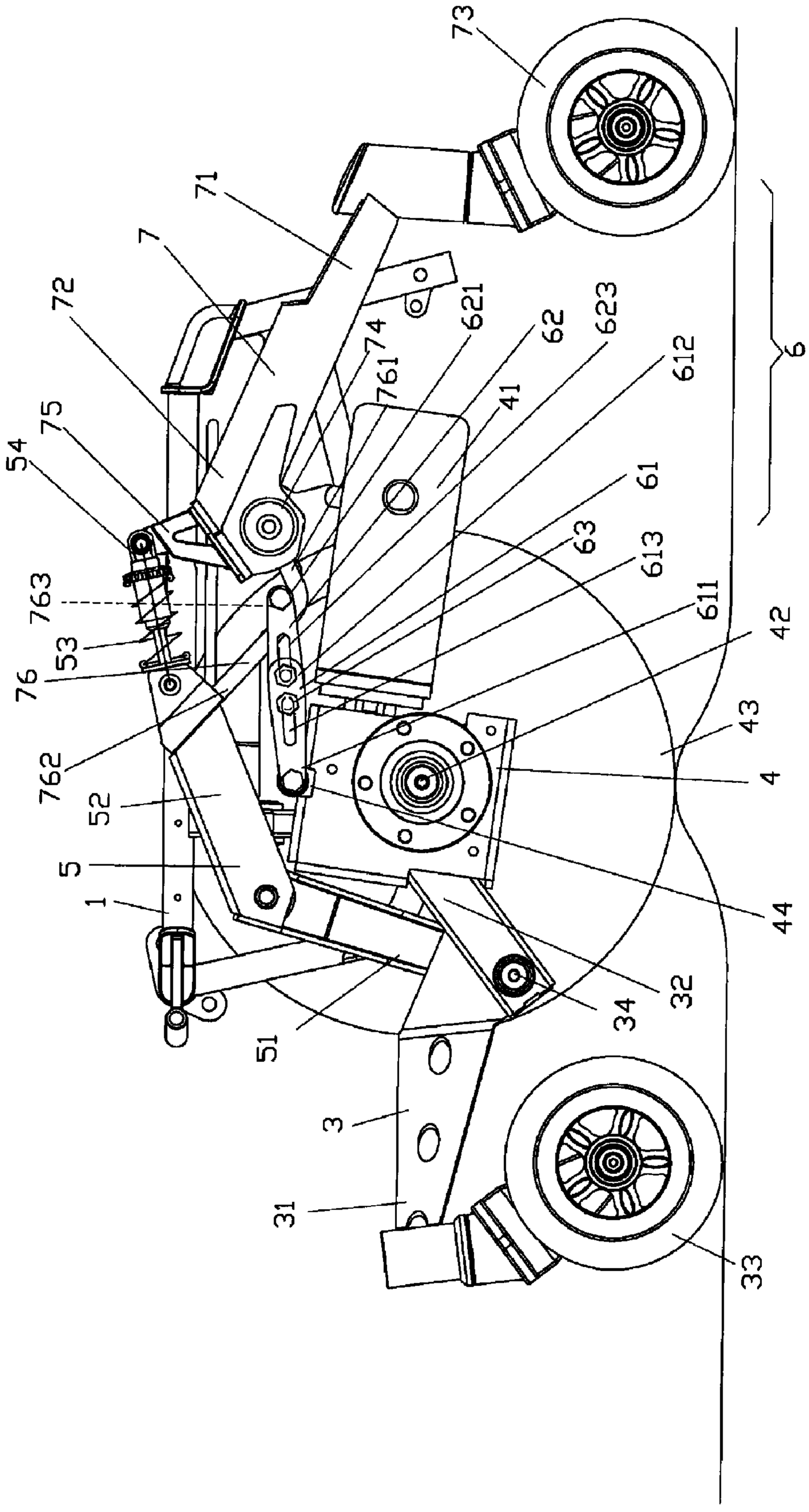
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FIG. 5

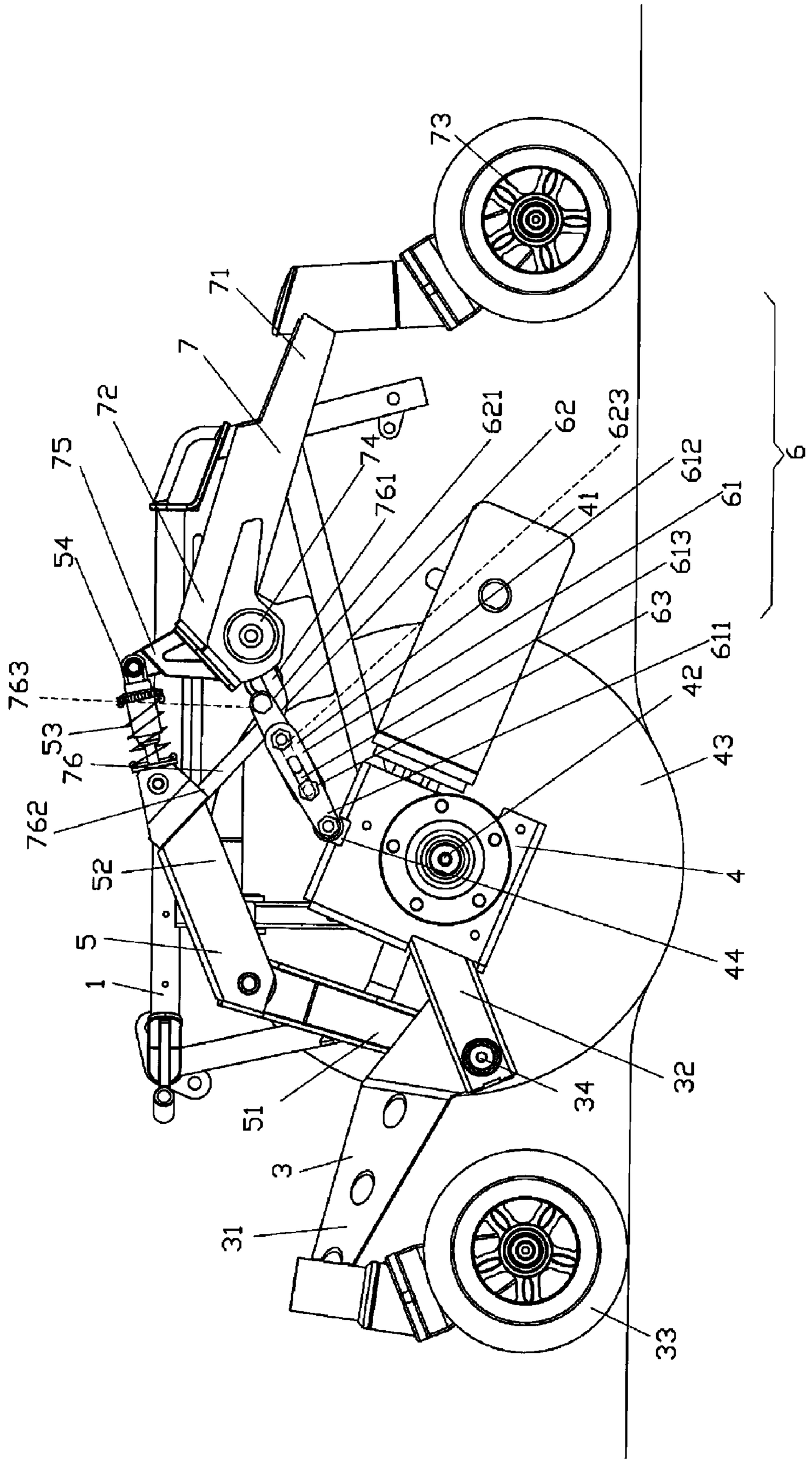
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FIG. 6

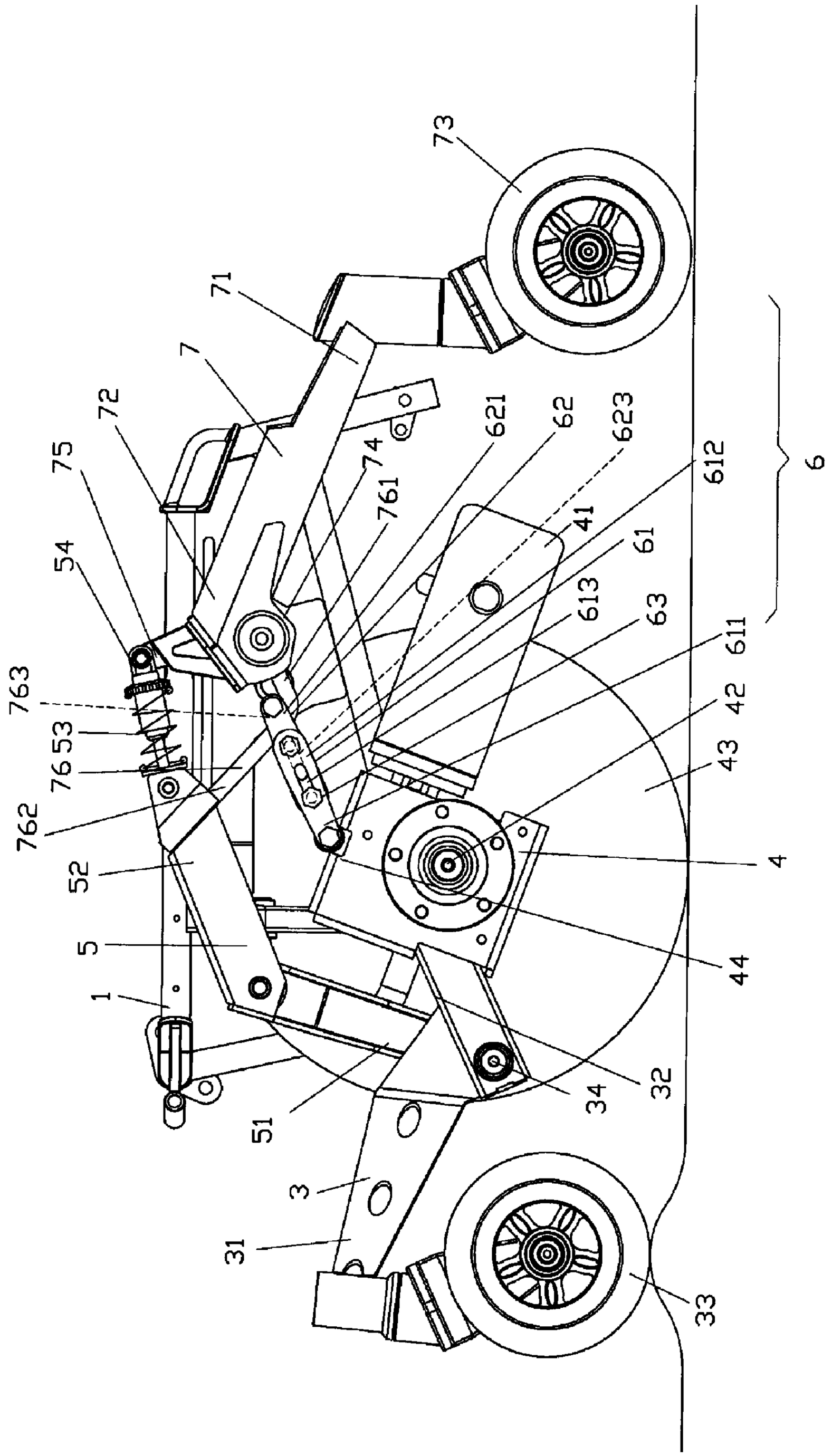
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FIG. 7

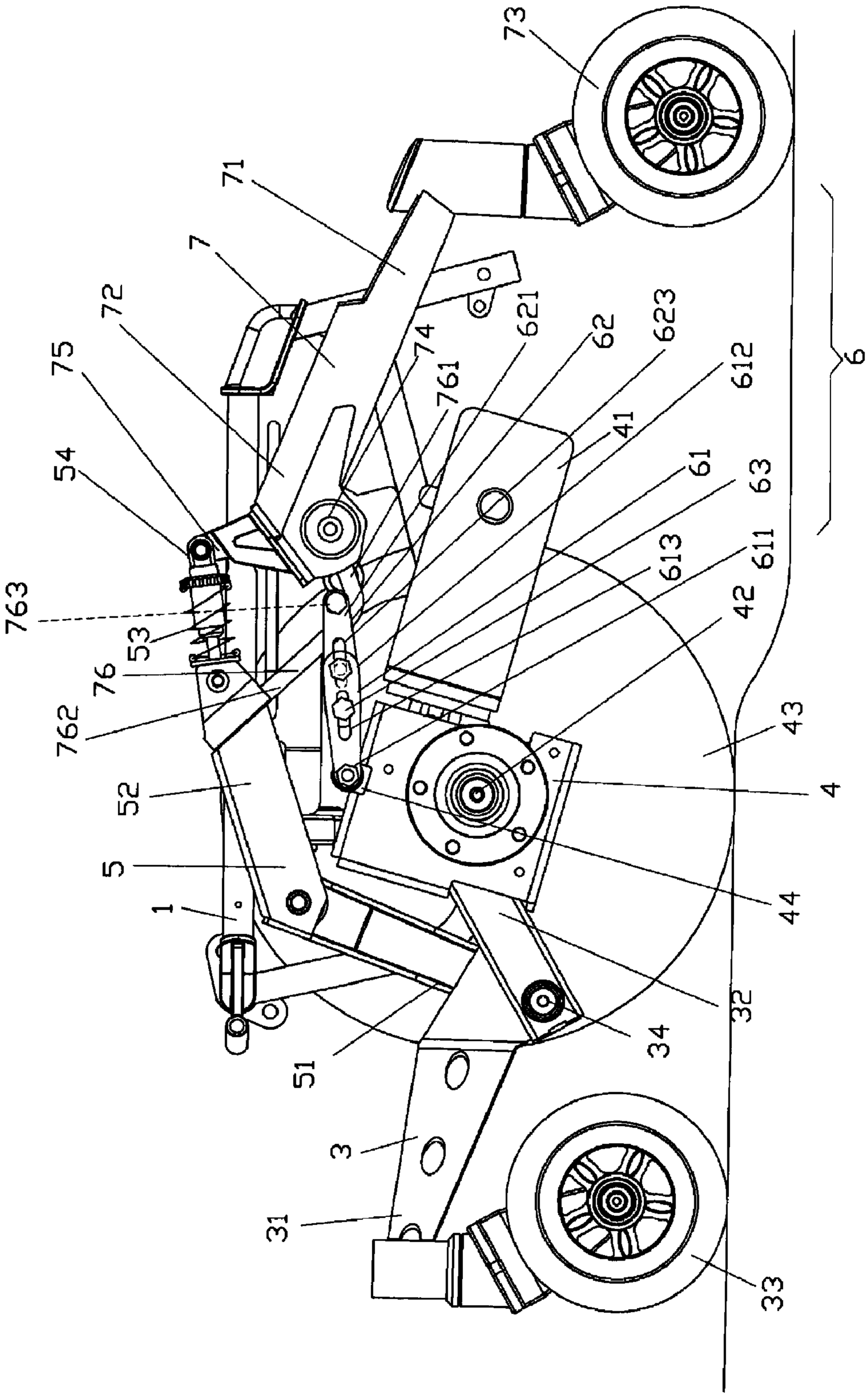
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FIG. 8

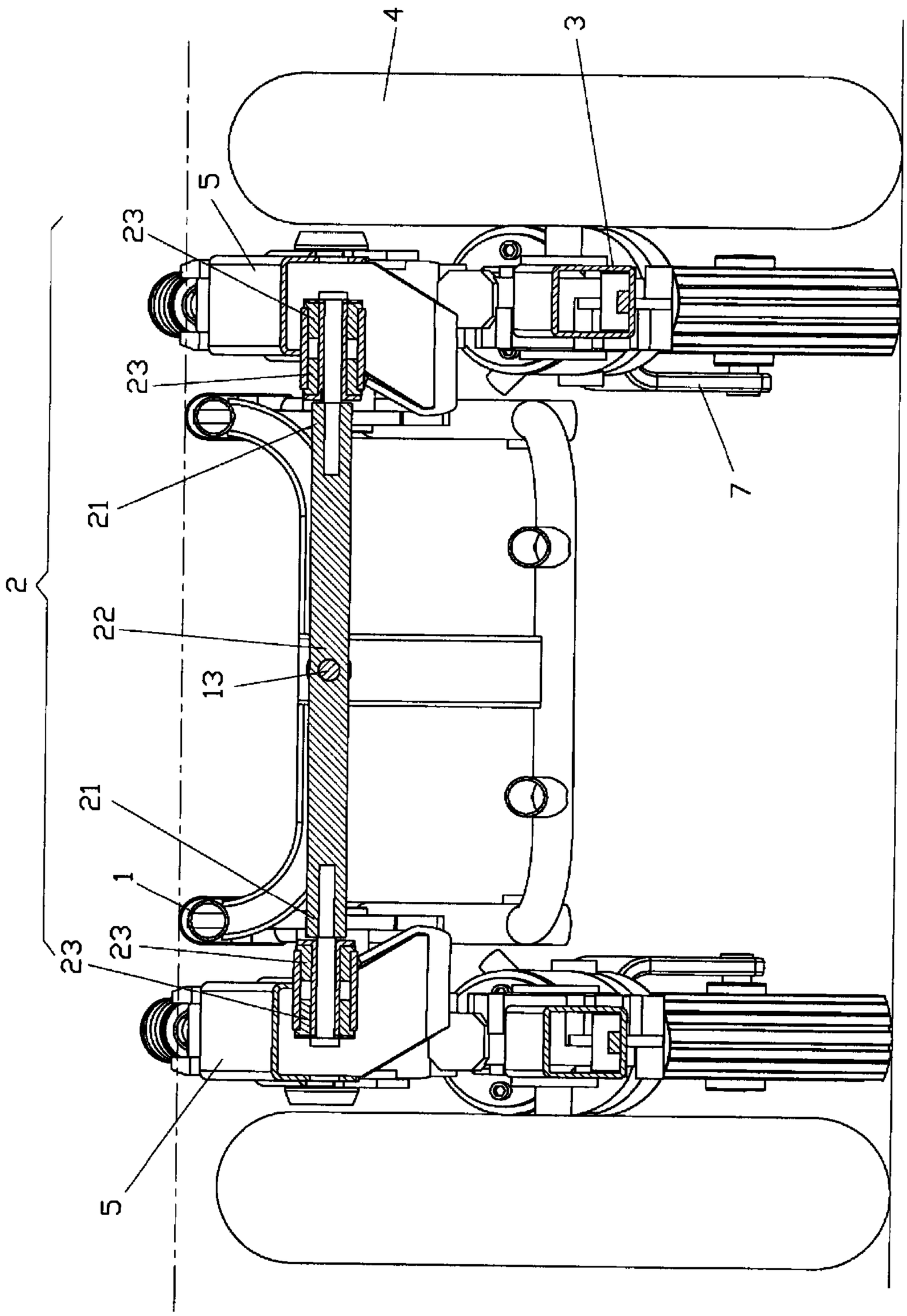

FIG. 9

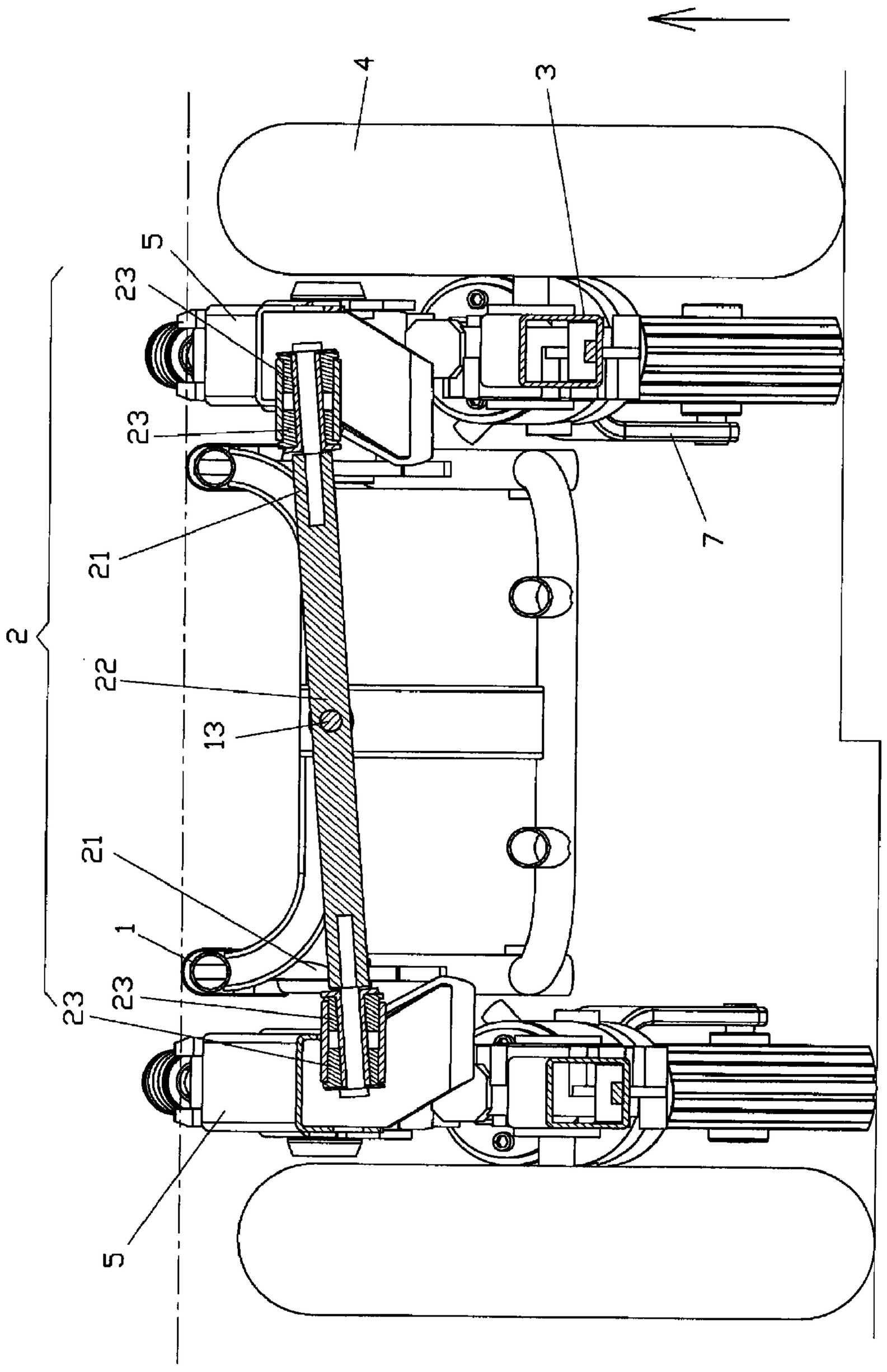

FIG. 10

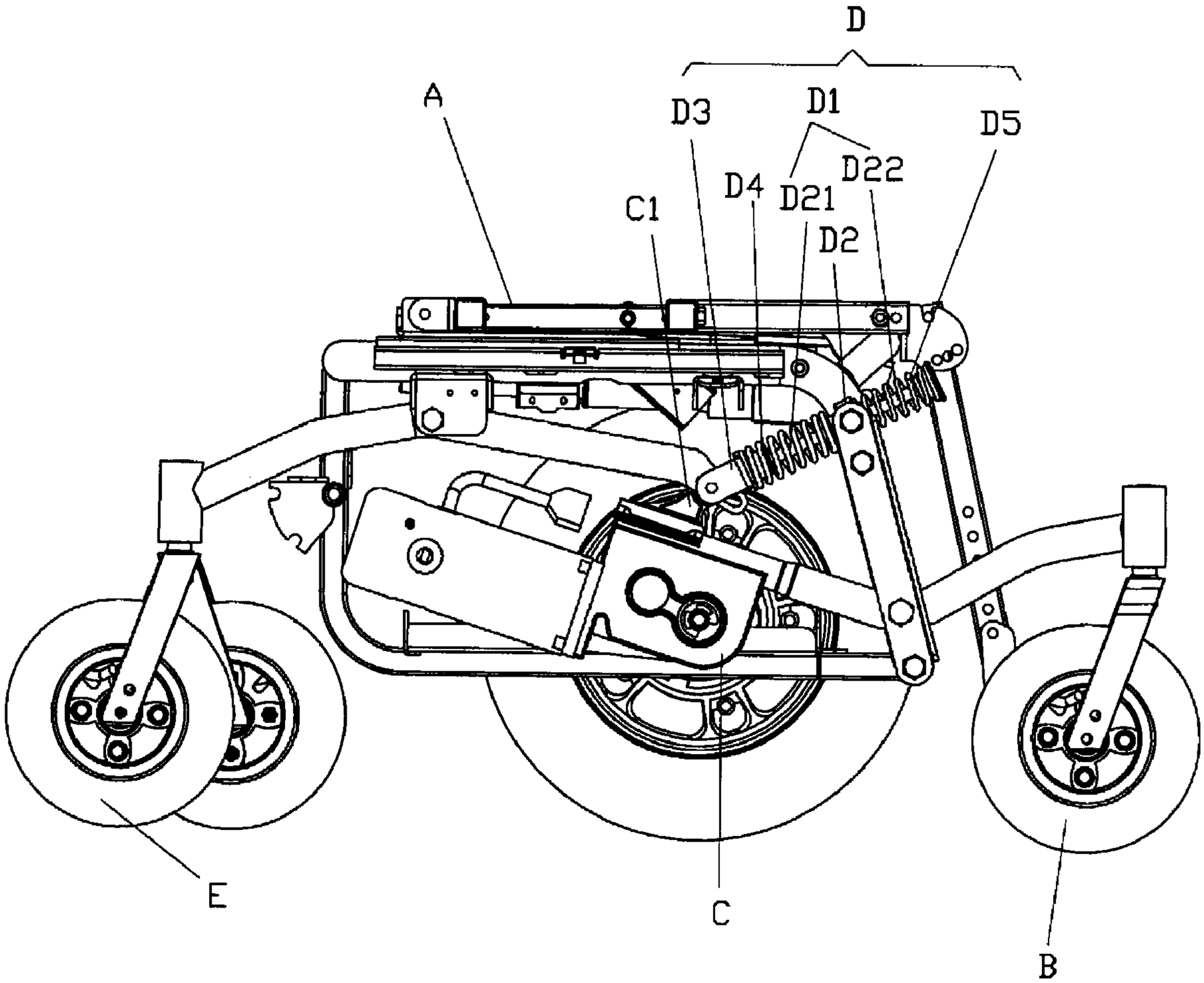

FIG. 11
(PRIOR ART)

CHASSIS STRUCTURE FOR MID-WHEEL DRIVE POWER WHEELCHAIR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a chassis structure for a mid-wheel drive power wheelchair, and more particularly to one that uses a restricting rack having a slot to absorb a slight drop height of a front wheel rod, a driving unit and a rear wheel rod and to maintain a balancing of wheels.

2. Description of the Prior Art

Wheelchairs are necessity to the elderly and some disabled people for their daily life. As shown in FIG. **11**, a conventional chassis structure for a mid-wheel drive power wheelchair comprises a frame A, a front wheel unit B, a driving unit C, a shock absorber unit D and a rear wheel unit E. The shock absorber unit D is pivotally connected to the frame A. The shock absorber unit D comprises a rod D**1** and a block D**2** at a central section thereof. The block D**2** has a first end D**21** and a second end D**22**. The block D**2** is secured to the frame A. The first end D**21** of the block D**2** is provided with a first connecting seat D**3**. The first connecting seat D**3** is secured to a connecting member C**1** of the driving unit C. A first elastic member D**4** is provided between the block D**2** and the first end D**21**, and a second elastic member D**5** is provided between the block D**2** and the second end D**22** for maintaining a high stability of the wheelchair and providing a shock absorbing effect.

However, if the wheelchair runs on a depression or a bump in a fast speed, the front wheel unit B, the driving unit C and the rear wheel unit E will have a differential drop height. Thus, the first elastic member D**4** and the second elastic member D**5** can not react in a first response and the wheelchair will have a minus vibration, which makes the rider uncomfortable. Once the vibration is too strong, the frame A may incline.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a chassis structure for a mid-wheel drive power wheelchair comprising:

a frame comprising a front section, two side sections, and three connecting rods, the three connecting rods being pivotally connected to the front section and the two side sections, respectively;

a transverse pipe having two ends and a middle section between the two ends, the middle section being connected with the connecting rod on the front section of the frame;

a pair of front wheel rods each having a first end, a second end and a first connecting portion between the first end and the second end, the first end being connected with a front wheel;

a pair of driving units each secured to the second end of a relative front wheel rod and comprising a driving wheel and a second connecting portion;

a pair of connecting racks each having a first end and a second end, the first end being pivotally connected to the first connecting portion of a relative front wheel rod, the second end being connected with to a press cylinder, the press cylinder having a third connecting portion, the pair of connecting racks being secured to the two ends of the transverse pipe, respectively;

a pair of restricting racks each comprising a first restricting plate and a second restricting plate, the first restricting plate having a first end, a second end and a first slot at a central portion thereof, the second restricting plate having a first end, a second end and a second slot at a central portion thereof, a first fixing member inserting through the second end of the first restricting plate and the second slot of the second restricting plate, a second fixing member inserting through the second end of the second restricting plate and the first slot of the first restricting plate, the first restricting plate and the second restricting plate overlapping for extending and restricting with each other, the first end of the first restricting plate being pivotally connected to the second connecting portion of a relative driving unit; and

a pair of rear wheel rods each having a first end and a second end, the first end being connected with a rear wheel, the second end having a fourth connecting portion and a fifth connecting portion and being connected with an action rod, the action rod having a first end and a second end, the connecting rod on a relative side section of the frame being inserted through the first end of the action rod and pivotally connected to the fourth connecting portion of the second end of a relative rear wheel rod, the second end of the action rod being secured to a relative connecting rack, the action rod having a sixth connecting portion, the sixth connecting portion being pivotally connected to the first end of the second restricting plate of a relative restricting rack, the fifth connecting portion of the second end of the rear wheel rod being connected to the third connecting portion of a relative press cylinder.

Preferably, the two ends of the transverse pipe are provided with rubber sleeves.

It is the primary objective of the present invention to provide a chassis structure for a mid-wheel drive power wheelchair, which has the best shock absorbing effect when running on a depression or on a bump.

It is another objective of the present invention to provide a chassis structure for a mid-wheel drive power wheelchair, which uses the press cylinders to maintain the front wheels and the rear wheels contact with the ground so that the wheelchair rolls in a steady status.

It is a further objective of the present invention to provide a chassis structure for a mid-wheel drive power wheelchair, which maintains the frame in a balancing and steady status.

It is still a further objective of the present invention to provide a chassis structure for a mid-wheel drive power wheelchair, which maintains the frame in the best straight position with the rubber sleeves covered on the two ends of the transverse pipe. When the wheelchair rolls on a bump, the rubber sleeves will absorb the twisted or torque force for maintaining the front wheel rods, the driving units, the connecting racks, and the rear wheel rods in a straight status.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the present invention;

FIG. **2** is a front view of the present invention;

FIG. **3** is a side view of the present invention;

FIG. **4** is a side view showing a driving wheel of the present invention running on a small depression;

FIG. **5** is a side view showing the driving wheel of the present invention running on a bump;

FIG. **6** is a side view showing the driving wheel of the present invention rolling on a big depression;

FIG. **7** is a side view showing a front wheel of the present invention rolling on a bump;

FIG. **8** is side view showing a rear wheel of the present invention rolling on a depression;

FIG. **9** is a front view showing the assembly of a transverse pipe of the present invention;

FIG. **10** is a front view showing the operation of the transverse pipe of the present invention; and

FIG. **11** is a side view of a conventional power wheelchair.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIGS. **1**, **2**, and **3**, a chassis structure for a mid-wheel drive power wheelchair of the present invention comprises a frame **1**, a transverse pipe **2**, a pair of front wheel rods **3**, a pair of driving units **4**, a pair of connecting racks **5**, a pair of restricting racks **6**, and a pair of rear wheel rods **7**.

The frame **1** comprises a front section **11**, two side sections **12**, and three connecting rods **13** connected to the front section **11** and the two side sections **12**, respectively.

The transverse pipe **2** has two ends **21** and a middle section **22** between the two ends **21**. The middle section **22** is pivotally connected to the connecting rod **13** on the front section **11** of the frame **1**. The two ends **21** of the transverse pipe **2** are covered with rubber sleeves **23**.

Each front wheel rod **3** has a first end **31**, a second end **32** and a first connecting portion **34** between the first end **31** and the second end **32**. The first end **31** is connected to a front wheel **33**.

Each driving unit **4** is secured to the second end **32** of a relative front wheel rod **3**, and comprises a motor **41**, a driving shaft **42**, a driving wheel **43**, and a second connecting portion **44**.

Each connecting rack **5** has a first end **51** and a second end **52**. The first end **51** is pivotally connected to the first connecting portion **34** of the front wheel rod **3**. The second end **52** is connected with a first end of a press cylinder **53**. A second end of the press cylinder **53** has a third connecting portion **54**. The two connecting racks **5** are secured to the two ends **21** of the transverse pipe **2**.

Each restricting rack **6** comprises a first restricting plate **61** and a second restricting plate **62**. The first restricting plate **61** has a first end **611**, a second end **612**, and a first slot **613** at a central portion thereof. The second restricting plate **62** has a first end **621**, a second end **622**, and a second slot **623** at a central portion thereof. With a fixing member **63** inserting through the second end **612** of the first restricting plate **61** and the second slot **623** of the second restricting plate **62** as well as another fixing member **63** inserting through the second end **622** of the second restricting plate **62** and the first slot **613** of the first restring plate **61**, the first restricting plate **61** and the second restricting plate **62** overlap, allowing them to be extended and restricted with each other. The first end **611** of the first restricting plate **61** is pivotally connected to the second connecting portion **44** of a relative driving unit **4**.

Each rear wheel rod **7** has a first end **71** and a second end **72**. The first end **71** is connected with a rear wheel **73**. The second end **72** has a fourth connecting portion **74** and a fifth connecting portion **75**. The second end **72** is connected with an action rod **76**. The action rod **76** has a first end **761** and a second end **762**. The connecting rod **13** on a relative side section **12** of the frame **1** is inserted through the first end **761** of the action rod **76** and pivotally connected to the fourth connecting portion **74** of the second end **72** of the rear wheel rod **7**, referring to the FIG. **2**. The second end **762** of the action rod **76** is secured to a relative connecting rack **5**. The action rod **76** has a sixth connecting portion **763** which is pivotally connected to the first end **621** of the second restricting plate **62** of the restricting rack **6**. The fifth connecting portion **75** of the second end **72** of the rear wheel rod **7** is connected with the third connecting portion **54** of the press cylinder **53**.

When the driving wheels **43** roll on a small depression, as shown in FIG. **4**, the second connecting portions **44** of the driving units **4** will push the first restricting plates **61** of the restricting racks **6** to displace, and the fixtures **63** will slide along the first slots **613** of the first restricting plates **61**. Thus, only the first restricting plates **61** are moved, and the second restricting plates **62** are not affected. Neither the front wheel rods **3** nor the rear wheel rods **7** will be affected by the depression. In case the driving wheels **43** roll on a bump, only the first restricting plates **61** will be raised (not shown in the drawings).

Therefore, the first restricting plates **61** will be affected to displace when either the driving wheels **43** or the front wheel rods **3** are descending or ascending. On the contrary, the second restricting plates **62** will be affected to displace when the rear wheel rods **7** are descending or ascending.

FIGS. **5** through **8** show the operation of the present invention. As shown in FIG. **5**, when the driving wheels **43** roll on a bump, in particular on a rough road, the driving units **4** will be linked to ascend, which brings the first restricting plates **61** of the restricting racks **6** to displace and pushes the connecting racks **5** to compress the press cylinders **53**. As shown in FIG. **6**, when the driving wheels **6** are descending, the driving units **4** will be linked to descend, which brings the first restricting plates **61** of the restricting racks **6** to displace and pulls the connecting racks **5** to restore the press cylinders **53** to their original positions.

As shown in FIG. **7**, when the front wheels **33** roll on a bump, the first connecting portions **34** of the front wheel rods **3** and the second connecting portions **44** of the driving units **4** will be linked to ascend. The first connecting portions **34** push the connecting racks **5** to compress the press cylinders **53**. The second connecting portions **44** bring the first restricting plates **61** to displace. On the contrary, when the front wheels **33** roll on a depression, the actuation from the above will be in an opposite direction.

As shown in FIG. **8**, when the rear wheels **73** roll on a depression, the rear wheels **73** will descend to rotate with the fourth connecting portions **74** of the second ends **72** of the rear wheel rods **7** functioning as fulcrums, which brings the second restricting plates **62** to displace by the action rods **76** and the fifth connecting portions **75** to restore the press cylinders **53**. On the contrary, when the rear wheels **73** rolls on a bump, the actuation from the above will be in an opposite direction.

To assemble the transverse pipe **2**, as shown in FIGS. **9** and **10**, the middle section **22** of the transverse pipe **2** is connected with the connecting rod **13** on the front section **11** of the frame **1**, and the two ends **21** of the transverse pipe **2** are secured to the connecting racks **5** and covered with the rubber sleeves **23** thereon. When the connecting racks **5** move upward and downward, the rubber sleeves **23** will absorb the twisted or torque force to maintain the front wheel rods **3**, the driving units **4**, the connecting racks **5**, and the rear wheel rods **7** in a straight status, so that the wheelchair remains in a steady movement. As shown in FIGS. **9** and **10**, the frame **1** is in a leveling status, which maintains the wheelchair in a steady status without shaking or inclining so as to provide a comfortable ride to the user.

What is claimed is:

1. A chassis structure for a mid-wheel drive power wheelchair comprising:

a frame comprising a front section, two side sections, and three connecting rods, the three connecting rods being pivotally connected to the front section and the two side sections, respectively;

a transverse pipe having two ends and a middle section between the two ends, the middle section being connected with the connecting rod on the front section of the frame;

a pair of front wheel rods each having a first end, a second end and a first connecting portion between the first end and the second end, the first end being connected with a front wheel;

a pair of driving units each secured to the second end of a relative front wheel rod and comprising a driving wheel and a second connecting portion;

a pair of connecting racks each having a first end and a second end, the first end being pivotally connected to the first connecting portion of a relative front wheel rod, the second end being connected with to a press cylinder, the press cylinder having a third connecting portion, the pair of connecting racks being secured to the two ends of the transverse pipe, respectively;

a pair of restricting racks each comprising a first restricting plate and a second restricting plate, the first restricting plate having a first end, a second end and a first slot at a central portion thereof, the second restricting plate having a first end, a second end and a second slot at a central portion thereof, a first fixing member inserting through the second end of the first restricting plate and the second slot of the second restricting plate, a second fixing member inserting through the second end of the second restricting plate and the first slot of the first restricting plate, the first restricting plate and the second restricting plate overlapping for extending and restricting with each other, the first end of the first restricting plate being pivotally connected to the second connecting portion of a relative driving unit; and

a pair of rear wheel rods each having a first end and a second end, the first end being connected with a rear wheel, the second end having a fourth connecting portion and a fifth connecting portion and being connected with an action rod, the action rod having a first end and a second end, the connecting rod on a relative side section of the frame being inserted through the first end of the action rod and pivotally connected to the fourth connecting portion of the second end of a relative rear wheel rod, the second end of the action rod being secured to a relative connecting rack, the action rod having a sixth connecting portion, the sixth connecting portion being pivotally connected to the first end of the second restricting plate of a relative restricting rack, the fifth connecting portion of the second end of the rear wheel rod being connected to the third connecting portion of a relative press cylinder.

2. The chassis structure for a mid-wheel drive power wheelchair as claimed in claim **1**, wherein the two ends of the transverse pipe are provided with rubber sleeves.

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